DISCUSSION PAPER

SUBJECT

Biological and Aquatic Community Integrity Assessments for Water Level Fluctuations in Impoundments

SITUATION

Many impoundments have biological aquatic communities and fringing wetlands that exist in their present state as a result of the impounded water level. The impoundments and the fringing wetlands are surface waters under RSA 485-A:2.XIV and Env-Ws 1702.46, and subject to water quality standards for biological and aquatic community integrity (Env-Wq 1703.19). This water quality standard is written such that the benchmark for attaining the water quality standard for the biological and aquatic community is "similar natural habitats of a region". Given that impoundments are not natural habitats, an issue has arisen as to how Env-Wq 1703.19 should be applied to impoundment assessment units. Therefore, an interpretation of the narrative standard is needed for impoundments, which takes into account the fact that physical habitat is significantly altered from a natural condition, new surface waters and wetlands may have been created, and dam operations may result in fluctuating water levels and flows that differ substantially from natural variations.

DEFINITIONS

Env-Ws 1703.19 Biological and Aquatic Community Integrity.

(a) The surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.

(b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

Biological Condition Gradient Matrix

Tier	State	Description
1	Natural or native condition	Native structural, functional and taxonomic integrity is preserved; ecosystem function is preserved within the range of natural variability.
2	Minimal changes in the structure of the biotic community and minimal changes in ecosystem function	Virtually all native taxa are maintained with some changes in biomass and/or abundance; ecosystem functions are fully maintained within the range of natural variability.
3	Evident changes in structure of the biotic community and minimal changes in ecosystem function	Some changes in structure due to loss of some rare native taxa; shifts in relative abundance of taxa but sensitive, ubiquitous taxa are common and abundant; ecosystem functions are fully maintained through redundant attributes of the system.

Tier	State	Description
4	Moderate changes in structure of the biotic community and minimal changes in ecosystem function	Moderate changes in structure due to replacement of some sensitive, ubiquitous taxa by more tolerant taxa, but reproducing populations of some sensitive taxa are maintained; overall balanced distribution of all expected major groups; ecosystem functions largely maintained through redundant attributes.
5	Major changes in structure of the biotic community and moderate changes in ecosystem function	Sensitive taxa are markedly diminished; conspicuously unbalanced distribution of major groups from that expected; organism condition shows signs of physiological stress; system function shows reduced complexity and redundancy; increased build up or export of unused materials.
6	Severe changes in structure of the biotic community and major loss of ecosystem function	Extreme changes in structure; wholesale changes in taxonomic composition; extreme alterations from normal densities and distributions; organism condition is often poor; ecosystem functions are severely altered.

Source: EPA (2005) www.epa.gov/bioiweb1/html/bcg.html

APPROACH

1. This guidance only relates to the biological aquatic community integrity component of the water quality standards (Env-Wq 1703.19). Application of this guidance cannot result in violations of other water quality standards in the impoundment.
2. Existing uses defined per Env-Wq 1702.23 cannot be eliminated except in the case of a dam removal to restore a natural condition.
3. Biological aquatic community integrity of impoundments relative to water level fluctuations will be evaluated using the biological condition gradient tiers established by the US Environmental Protection Agency (http://www.epa.gov/bioiweb1/html/bcg.html). Multiple biological metrics will be used to determine the tier for the existing condition in the impoundment. DES will develop more specific guidance for translating the biological condition gradient tiers to monitoring data.
4. Except for situations described in # 7 and #8 below, reasonable historical fluctuation of water levels due to operation of the impoundment consistent with the primary purpose for the impoundment will not be considered to cause or contribute to impairment of biological aquatic community integrity per Env-Wq 1703.19.
5. A change in impoundment use or operation from historic practice will constitute a hydrologic modification under Env-Wq 1701.02(b) for the purposes of 401 Water Quality Certification. An increase in water level fluctuations relative to historic practice will be reviewed under the anti-degradation provisions of Env-Wq 1700. Changes from historic practice in the impoundment will be acceptable so long as the biological condition gradient tier remains the same.
6. If the proposed water level fluctuations in the impoundment will result in a worsening of the biological condition gradient tier, an antidegradation analysis will be required if the biological condition is no worse than tier 4. If, however, the biological condition will be degraded to tier 5 or tier 6, a use attainability assessment per Env-Wq 1709.01(b)(4) will be required.

7. Historic water level fluctuations in an impoundment shall be considered acceptable unless there is substantial evidence of significant impacts to the biological aquatic community. Significant impacts will be defined as a biological condition gradient tier of 5 ("Major changes in structure of the biotic community and moderate changes in ecosystem function") or 6 ("Severe changes in structure of the biotic community and major loss of ecosystem function"). If the existing condition in an impoundment is determined to be tier 5 or 6, then either restoration to tier 4 or a use attainability assessment per Env-Wq 1709.01(b)(4) will be required.
8. Water level fluctuations performed to comply with a water management plan for protected instream flows per Env-Wq 1900 shall be acceptable even if the biological aquatic community is affected, provided the biological condition is no worse than tier 4. The trade-off between different biological communities will have been made explicit in the water management plan and will have undergone full public participation before implementation. If, however, the biological condition is determined to be tier 5 or 6, a use attainability assessment per Env-Wq 1709.01(b)(4) will be required.
9. Biological data from impoundments will be assessed for 305b/303d listings using the biological condition gradient tiers. DES will develop more specific guidance for impairment determinations.
10. The target species and habitats for any studies of the effects of water level fluctuations on the biological aquatic community shall include but not be limited to: fringing wetlands, benthic macroinvertebrates, benthic macrophytes, and fish.
11. For 401 Water Quality Certificate applications, DES may request that the applicant supply any or all of the following types of information:
    - volume of impoundment at full pool;
    - watershed area;
    - areal water load;
    - bathymetry of impoundment;
    - proposed timing and frequency of drawdown;
    - proposed duration of drawdown;
    - proposed volume of water released per unit time;
    - proposed type of release (surface, mid-depth, bottom);
    - proposed ratio of impoundment discharge to normal discharge in stream below the dam;
    - primary use of the dam;
    - historical water level fluctuations under normal operations;
    - map of fringing wetlands delineated from high-resolution aerial photography;
    - the percent of the littoral zone that would be dewatered under the proposed water level fluctuation; and
    - baseline data on any of the target species, if available.